



032304

13281 U.S. PTO

## PACKING BOX AND PACKING METHOD

### Background of the Invention

#### 1. Field of the Invention

5           The present invention relates to a packing box for a packing object product and a packing method for the same.

#### 2. Description of the Related Art

          A product is packed in a packing box and  
10   conveyed. During conveying the product, if the packing box drops out from a conveyer, the packing box receives a shock. As a result, the packing box deforms, and the product is damaged. In particular, if a corner of the packing box receives the shock,  
15   there is a possibility that the packing box can not absorb the shock, and the product in the packing box is severely damaged. However, it is very difficult to perfectly eliminate the drop accident of the packing box. Thus, a packing box for and a packing method of  
20   reducing the damage to the product accommodated in the box at the time of the drop of the box have been developed.

          Conventionally, a fragile part (for example, an electrical part) is packed in a shock absorber such  
25   as an air cap sheet and accommodated in a box main body, as shown in Fig. 1. In this conventional example, it is necessary to increase an amount of

shock absorber for packaging the product, in order to reduce the shock to the product accommodated in the packing box at the time of the drop accident.

In conjunction with the above description,  
5 Japanese Laid Open Patent Application (JP-A-Showa, 60-45166) discloses a conventional technique for placing cushion material between a box main body and a product or between the box main body and an air cap sheet, in order to reduce the shock to the product. However,  
10 the increase in the air gap sheet and cushion material causes a larger amount of waste after the conveyance. In particular, it is difficult to reproduce the air cap sheet as a resource and the waste gives a bad influence on natural environment.

15 Also, Japanese Laid Open Patent Application (JP-A-Heisei 11-227750) discloses a conventional packing box in which a cushion material made of paper is used without any usage of a cushion material made of resin such as the air gap sheet. However, the  
20 packing box is for a packing target product of a peculiar shape in many cases. In such a packing box, the packing target object is limited to the product having the particular size and shape.

Also, in the conventional packing box  
25 disclosed in Japanese Registered Utility Model 3048485, the structure of cushion made of paper is complex, and it is necessary to assemble the cushion

in a complicated procedure. For this reason, a lot of time is wasted for the assembly.

Also, Japanese Laid Open Patent Application (JP-A-Heisei 2-139369) discloses another conventional  
5 packing method, in which air cap sheet and shock absorber are filled between a box main body and the packing object product without any gap. For this reason, the product accommodated therein is easily influenced by vibration during the conveyance. Thus,  
10 it is unsuitable to the product sensitive to the influence of the vibration.

Also, in Japanese Laid Open Patent Application (JP-P2001-130640A), a conventional packing box is known in which the inside of the packing box  
15 accommodating a product is not fully filled.

### Summary of the Invention

Therefore, an object of the present invention is to provide a packing box and a packing method, in  
20 which a product in a box main body is insusceptible to influences of vibration and shock during a conveyance.

Also, another object of the present invention is to provide a packing box and a packing method, in which a product is insusceptible to influence of a  
25 drop accident during the conveyance.

Also, another object of the present invention is to provide a packing box and a packing method, in

which load on natural environment is small.

In an aspect of the present invention, a packing box includes a box main body; and an inner plate on which a packing object is fixed by at least a  
5 holding band. The inner plate is accommodated in the box main body and is kept in a horizontal direction.

Here, the inner plate may include a main plate on which the packing object is fixed; a set of first plates which bendably extend from each of first  
10 ends of the main plate opposing to each other; and a set of second plates which bendably extend from each of second ends of the main plate opposing to each other. The packing object is desirably fixed at a center of the main plate such that the packing object  
15 is not contact with inner walls of the box main body. In this case, the first plates are separated by a first gap, and the second plates are separated by a second gap. Also, the packing object is desirably wrapped by a first holding band passing through the  
20 first gaps between the first plates of each of the sets for the first ends, and the packing object is desirably wrapped by a second holding band passing through the second gaps between the second plates of each of the sets for the second ends.

25 Also, the box main body may have a rectangular parallelepiped shape, and the main plate may be rectangular. The first plates are desirably

bent upwardly, and the second plates are desirably bent downwardly. In this case, a summation of an extending length of the first plate and an extending length of the second plate is desirably substantially  
5 equal to an inner height of the box main body. Also, it is desirable that the extending length of the first plate is substantially equal to the extending length of the second plate such that the main plate is held at a middle position in the box main body.

10 In another aspect of the present invention, a method of packing a packing object in a packing box, is achieved by fixing the packing object on an inner plate, by bending the first plates upwardly and the second plates downwardly; and accommodating the inner  
15 plate in the box main body to keep the inner plate in a horizontal direction. The inner plate includes a main plate on which the packing object is fixed, a set of first plates which bendably extend from each of first ends of the main plate opposing to each other,  
20 and a set of second plates which bendably extend from each of second ends of the main plate opposing to each other.

Here, the fixing may be achieved by fixing the packing object at a center of the main plate such that  
25 the packing object is not in contact with inner walls of the box main body.

Also, a summation of an extending length of the first plate and an extending length of the second plate may be substantially equal to an inner height of the box main body. It is desirable that the extending  
5 length of the first plate is substantially equal to the extending length of the second plate such that the main plate is held at a middle position in the box main body.

Also, the first plates may be separated by a  
10 first gap, and the second plates are separated by a second gap. In this case, the fixing may be achieved by wrapping the packing object by a first holding band passing through the first gaps between the first plates of each of the sets for the first ends; and by  
15 wrapping the packing object by a second holding band passing through the second gaps between the second plates of each of the sets for the second ends.

#### **Brief Description of the Drawings**

20 Fig. 1 is a diagram showing a conventional packing box;

Fig. 2 is a developed view of an inner bottom plate of a packing box according to an embodiment of the present invention;

25 Fig. 3 is a diagram showing a state in which a packing object product is attached to the inner bottom plate;

Figs. 4A to 4C are diagrams showing the state in which the packing object product is fixed to a main plate;

Fig. 5 is a diagram showing the state when the inner bottom plate is accommodated in a box main body in this embodiment;

Fig. 6 is a diagram showing the state of a part of the inner bottom plate when the packing object product is fixed to the main plate by means of the holding band; and

Fig. 7 is a diagram showing the inner bottom plate when the packing object product is fixed to the main plate by means of the holding band 3.

#### 15                   **Description of the Preferred Embodiment**

Hereinafter, a packing box according to the present invention will be described in detail with reference to the attached drawings.

Fig. 2 is a developed view of an inner bottom plate 1 of the packing box according to an embodiment of the present invention. Referring to Fig. 2, the inner bottom plate 1 is composed of a substantially rectangular main plate 1a that a packing object product is provided in a center portion of the inner bottom plate 1. Two sets of two first height adjusting plates 1b are coupled to long sides opposing to each other of the main plate 1a at ends of the long

sides, respectively. Two sets of two second height adjusting plates 1c are coupled to short side adjacent to the long sides of the main plate 1a at ends of the short sides, respectively. The first height adjusting  
5 plates 1b have the same shape, and the second height adjusting plates 1c have the same shape. A first gap is provided between the two first height adjusting plates 1b of each set. Also, a second gap is provided between the two second height adjusting plates 1c of  
10 each set. The height adjusting plates are coupled to the main plate in the above description, but the inner bottom plate 1 may be cut out from a plate to have the above shape.

Fig. 3 is a diagram showing a state in which  
15 the packing object product is attached to the inner bottom plate 1. Referring to Fig. 3, the packing object product 4 is fixed to the inner bottom plate 1 in the developed state. The packing object product 4 is placed on the inner bottom plate 1 such that the  
20 center of gravity of the packing object product 4 and the center of gravity of the main plate 1a overlap on a substantially same position. Also, the packing object product 4 is placed such that the long sides of the packing object product 4 are substantially  
25 parallel to the long sides of the main plate 1a. The packing object product 4 placed on the main plate 1a is fastened and fixed to the main plate 1a by first



and second holding bands 3. The first and second holding bands 3 have the widths approximately equal to the first and second gaps, respectively. The first holding band 3 is wrapped around the main plate 1a at least one round to fasten the packing object product 4 in such a way that the first holding band 3 passes through the first gap. Also, the second holding band 3 is wrapped around the main plate 1a at least one round to fasten the packing object product 4 in such a way that the second holding band 3 passes through the second gap.

Figs. 4A to 4C are diagrams showing the state in which the packing object product 4 is fixed to the main plate 1a. As shown in a plan view of Fig. 4A, the packing object product 4 is fixed to the main plate 1a by the first and second holding bands 3. As shown in a front view of Fig. 4B, the two sets of the two first height adjusting plates 1b are bent in the long sides of the main plate 1a from the height direction upwardly by about 90 degrees. On the other hand, as shown in a side view of Fig. 4C, the two sets of the two second height adjusting plates 1c are bent in the short sides of the main plate 1a from the height direction downwardly by about 90 degrees.

Fig. 5 is a diagram showing the state when the inner bottom plate 1 is accommodated in a box main body 2 in this embodiment. Referring to Fig. 5, the

packing box in this embodiment is composed of the inner bottom plate 1 and the box main body 2. The inner bottom plate 1 is formed of strong paper such as corrugated paper. The box main body 2 is a box formed of strong paper such as the corrugated paper, and has an opening. Also, the box main body 2 has flaps 2c used to close this opening. The inner bottom plate 1 on which the packing object product 4 is placed is accommodated from the opening in the box main body 2. Then, the opening is closed by the flaps 2c, and the packing box is distributed by a distributing vehicle or the like. From this viewpoint, the box main body 2 is desired to have the shape of a substantially rectangular parallelepiped, and to comply with a standard defined in a distributing industry.

Thus, inner surfaces 2b of the box main body 2 are in contact with the outer side surfaces of the first and second height adjusting plates 1b and 1c of the inner bottom plate 1, to support the inner bottom plate 1. The tip portions of the second height adjusting plates 1c are in contact with an inner bottom surface 2a of the box main body 2 to support the inner bottom plate 1. Also, the tip portion of the first height adjusting plates 1b are contact with the inner surface of the flaps 2c of the box main body 2 to support the inner bottom plate 1 in the box main body 2. Also, the height of the inner bottom plate 1

is substantially equal to a sum of the height  $t_1$  of the first height adjusting plate and the height  $t_2$  of the second height adjusting plate. This sum  $t_1+t_2$  is slightly smaller than the inner height  $T$  of the box

5 main body 2

In this way, the main plate 1a of the inner bottom plate 1 is kept in the horizontal direction in the box main body 2, because the second height adjusting plates 1c have the same height. When the  
10 first height adjusting plates 1b have the same height and the first height adjusting plate 1b and the second height adjusting plate 1c have the same height, the main plate 1a of the inner bottom plate 1 is kept in the horizontal direction at a center position of the  
15 box main body 2 in a height direction.

It should be noted that the width of the first gap and that of the second gap may be equal to each other. The first gap and the second gap are desirably formed in such a way that the strength on  
20 the structure of the inner bottom plate 1 is not damaged. The width of each gap is determined based on parameters such as the length of the long side of the main plate 1a, the length of the short side of the main plate 1a, the height of the packing object  
25 product 4, the length of the long side of the packing object product 4, the length of the short side of the packing object product 4, the weight of the packing

object product 4.

Fig. 6 is a diagram showing the state of a part of the inner bottom plate 1 when the packing object product 4 is fixed to the main plate 1a by means of the holding band 3. The holding band 3 generates a force  $F_1$  in a first direction and a force  $F_2$  in a second direction. The generated  $F_1$  and  $F_2$  act as a synthesized force  $F_3$  against the packing object product 4, to fix the packing object product 4 to the main plate 1a of the inner bottom plate 1.

The holding band 3 is desired to be a film-shaped band having a self-adhesive property, as represented by FITLAP (made by Shinetsu Kogyo Co., Ltd., Registered Trade-Mark, Catalog Dated on February 7, 2002, Item Number #50). By wrapping the holding band 3 around the packing object product 4 placed on the main plate 1a, the packing object product 4 is fastened to the main plate 1a and held. Through use of the holding band 3 having a self-adhesive property, the packing object product 4 can be fixed to the main plate 1a without depositing the adhesive component on the packing object product 4. Thus, it is possible to protect the damage to the packing object product 4 caused by the adhesive component of the holding band 3.

If the holding band 3 having a stretching property as well as the self-adhesive property is

used, the packing target object is strongly held by the inner bottom plate 1. Also, the holding band 3 is desired to be made of the material that has the self-adhesive property and the stretching property and can be reproduced as resource. Consequently, without any usage of the fixing materials more than necessary, the packing object product 4 can be packed, thereby reducing the cost. Moreover, since the wastefulness of the resource is avoided and the exhausted waste is reduced, the load on the natural environment is reduced.

The inner bottom plate 1 is accommodated in the box main body 2 and supported on the inner surfaces of the box main body 2. The packing object product 4 is not in direct contact with the box main body 2. There is a space between the bottom surface 2a in the box main body, the box main body side wall surface 2b, the flap 2c and the packing object product 4. The existence of the space reduces influence on the packing object product 4, when the packing box is deformed by shock applied from outside the packing box.

Fig. 7 is a diagram showing the inner bottom plate 1 when the packing object product 4 is fixed to the main plate 1a by means of the holding bands 3. Referring to Fig. 7, the inner bottom plate 1 accommodated in the box main body 2 has the space

between the main plate 1a of the inner bottom plate 1, to which the packing target object is fixed, and the bottom surface 2a in the box main body. Since the inner bottom plate 1 is supported by the box main body 2, the packing object product 4 is protected against a strong shock. In addition, the space from the bottom surface 2a in this box main body absorbs small vibration received by the packing box during the conveyance, and consequently reduces the vibration received by the packing object product. Consequently, the damage of a precise machine, an electronic part and the like, which are susceptible to influence of the small vibration during the conveyance is largely improved.

15           The packing box in this embodiment needs not limit the shape of the packing object product 4. The packing object product 4 is enough to be placed on the main plate 1a of the inner bottom plate 1, at the size of the longitudinal length  $l$ , the lateral length  $w$  and 20 the height  $t_2$ , respectively. Therefore, most of object products which can be accommodated in the box main body 2 can be packed. Also, even if the packing object product 4 has a very special shape, the packing box in this embodiment can sufficiently correspond to 25 it by using several packing materials and arranging its outer shape.

As mentioned above, according to the packing

box of the present invention, an air cap sheet for wrapping the packing target object and cushion inserted between the box main body and the product need not to be used. The packing box can reduce a  
5 usage amount of packing materials, especially, the packing materials that can not be reproduced, and save resources and reduce a packing cost, as compared with the conventional packing method.

Also, there is the space between the main  
10 plate of the inner bottom plate, on which the packing target object is placed, and the bottom surface in the box main body. Thus, the main plate of the inner bottom plate can absorb vibration and shock during the conveyance. In particular, the packing box can reduce  
15 a trouble of the product such as precise machines and electronic parts, which are easily influenced by continuous small vibrations in the course of the conveyance.

Moreover, the packing target object can be  
20 separated away from the wall of the box main body. Thus, even if the corner of the packing box receives a shock because of the drop of the box main body, the product can be protected.

In addition, it is possible to provide the  
25 packing box that is simpler in the structure than the conventional packing box using cushion made of the paper. Thus, the working time necessary for the

packing can be reduced and the manufacturing cost of the packing box can be saved.